Time and entropy.

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Abstract

This paper presents a new theory about the physics of time and as a result a new interpretation of a cosmological redshift is given. We describe a laboratory experiment, numerical estimates and observation effects, which can test this new theory.

Postulates

We'll define entropy as the irreversible dispersion of energy.
We postulate that:

1 Time is a form of energy (as a field), and we perceive its intensity (energy density) as the speed of time current, i.e. the greater the density of time the faster it goes.

2 Time is correlated with entropy. An increase in entropy will cause a corresponding increase in the density of time. In reality, diffused energy (entropy) has been converted into time energy, i.e. the Universe is a closed system. (An energy conservation Law is true at any moment of time for both the Universe as whole and for any part of its). We can say that the potential energy of matter has been converted into the kinetic energy of time.

3 An object moving at the speed of light doesn't interact with time, i.e. it contains information about the time it is created (e.g. photon).

These postulates violate the second law of thermodynamics if the gradient of entropy is large. For small gradients, the second law holds approximately.

Other consequences of these postulates are :
1.As the entropy of the Universe increases time is accelerated.
Let's analyze a "stationary" entropy process. During a period of time dT an entropy increase by a factor m results in an acceleration of time by a factor n ($n > 1$). The next period δT_1 will be $1/n$ times shorter, but during this period the entropy will also increase m times, as the process is "frozen" into the time. This results in time being accelerated exponentially.
Let's analyze this from the position of a cosmological redshift. Assume a photon is emitted with frequency hv, and after a certain period of time is registered by a radiation receiver. During this period the current of time is accelerated n times. Therefore the radiation receiver registers the photon with frequency hv/n and this is the observed redshift effect. It will depend only how long the photon has existed, i.e. the longer the time, the greater redshift effect. In other words, the further from the observer the source of emission is, the greater redshift, and the principle of symmetry is true for this effect. This means that two objects located some distance from each other observe one another to have the same redshift. Therefore, cosmological redshift may be explained by the effect of time acceleration.
The Hubble constant is the numerical derivative of the speed of time, i.e. it is the acceleration of time (see Fig.1), and has units of acceleration, i.e. a variation of frequency of radiation (sec^{-1}) divided by a time period (sec).

Numerical estimates.

Let us estimate the time acceleration from a Hubble constant.

$$H \approx 60\ km\ sec^{-1}\ MPc^{-1}$$

The time it takes light to travel $1MPc \approx 10^{14} sec$

$$v/c = aT => 60/3 \times 10^5 = 10^{14} a$$

where: c - speed of light;a - acceleration of time; T - time period.
As result a second decreases by $\underline{2 \times 10^{-18} sec}$ per second.
We can compare this value with the value calculated from the correction to the equinox after all known precessions are accounted for. Figure 2 shows the Equinox corrections from solar and lunar observations [1].
The Equinox was determined with the help of chronometers. Our standards of time are atomic and are "frozen" into time. From the above discussion it follows that during this time period a second decreased, and resulted in the corrections presented in figure 2.

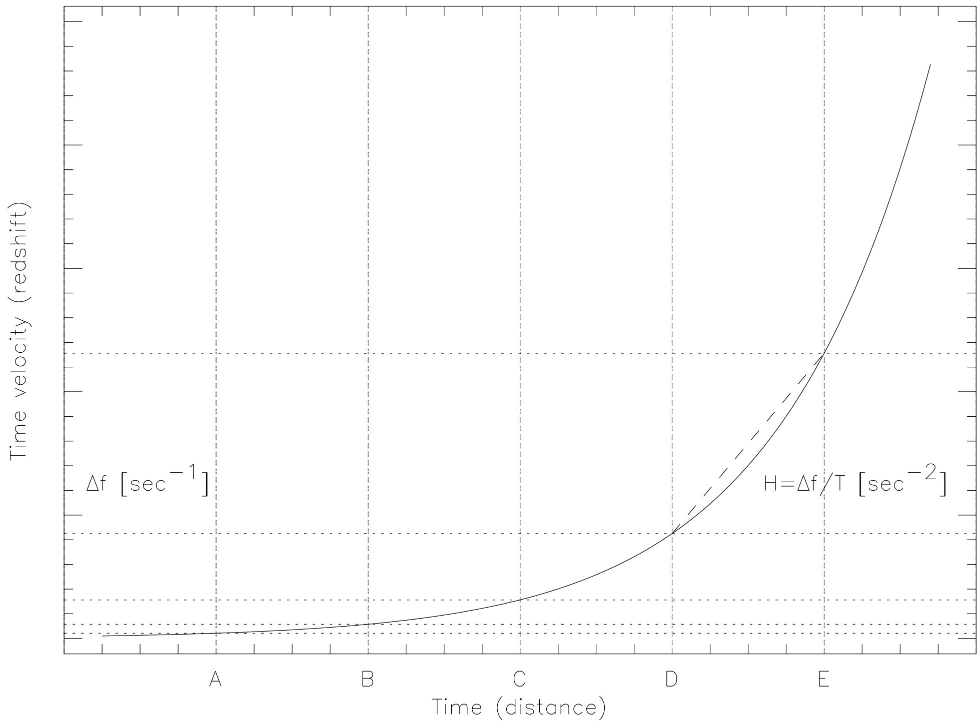


Figure 1: Redshift (time velocity) evolution.

Let's estimate the time acceleration using a linear approximation and the formula: $dT = at^2/2 => a = 2dT/t^2$. The numerical data from [1] ($\dot{E} = +0.00085$ sec per year) give $\underline{a \approx 1.7 \times 10^{-18} sec}$ per second.
Comparing this result with that calculated from the Hubble constant we see the orders of the values are the same.

Observations and experiments.

From Fig.1 we see that:

- If AB=CD the measured redshift corresponding to them is not equal. It increases non-linearly with the passage of time, i.e for an observation of a single object its redshift will increase non-linearly with time (see Supernovae project result: $http://www-supernova.lbl.gov/$);
- Hubble constants calculated for objects located at different distances are not equal

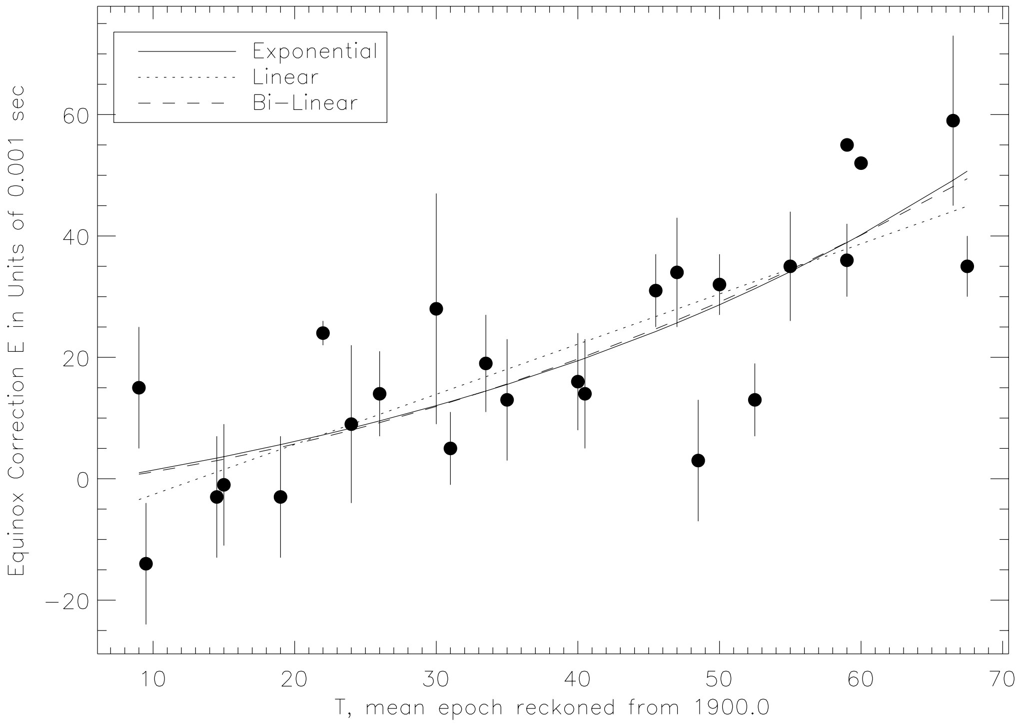


Figure 2: Equinox corrections from solar and lunar observations. Three different interpolations are also presented, an exponential interpolation (solid line; sigma =121.87); a linear interpolation (dot line; sigma=127.56); bi-linear interpolation (dash line; sigma=122.42).

(the further away an object is the smaller the Hubble constant, i.e.$H_{DE} > H_{CE} > H_{BE} > H_{AE}$).

- For the same object located on different sides of the galaxy (like M31), a different cosmological redshift will be observed.

The consequence will be that, within the bounds of generally accepted theory of distance definition, the most distant objects will have greater absolute sizes and intensities (magnitudes) than their local analogs. This is a result of an incorrect definition of distance . (One should not use the Hubble constant calculated from nearby objects to measure the distance to more distant objects).

A laboratory experiment.

A localization of entropy processes suggest that the increasing energy of time (its acceleration) is also localized in space and decreases with distance. On the basis of these ideas the following experiment has been devised (see.Fig 3).
The experimental technique is as follow,

a) measure the frequency of radiation from the laser (2)

b) heat the liquid in the vessel (1)

c) measure the frequency of radiation from the laser (2) while the liquid is boiling

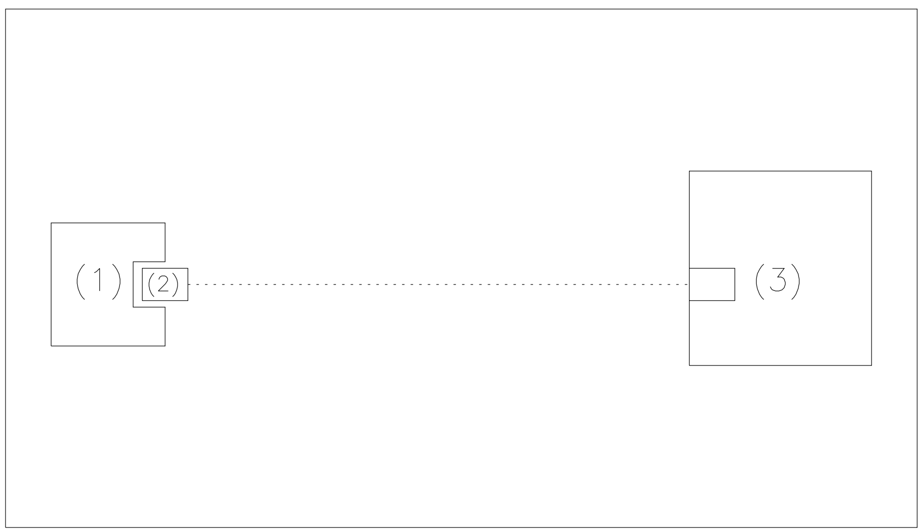


Figure 3: An experimental device for measuring entropy blueshift. 1 – entropy source (vessel containing a boiling liquid); 2 – laser source(milliwatt); 3 – high resolution spectrometer.

The idea of the experiment consists of the following:

the boiling liquid in the vessel increases the entropy locally, i.e. it accelerates time. The radiation from the laser source is generated at the faster time while the spectrometer measures the radiation at the slower time. As a result the radiation registered from laser source during the boiling of the liquid has a higher frequency than without boiling the liquid. Increasing the intensity of the boil (generating more entropy) will cause the frequency of observed radiation to increase.

Some ideas

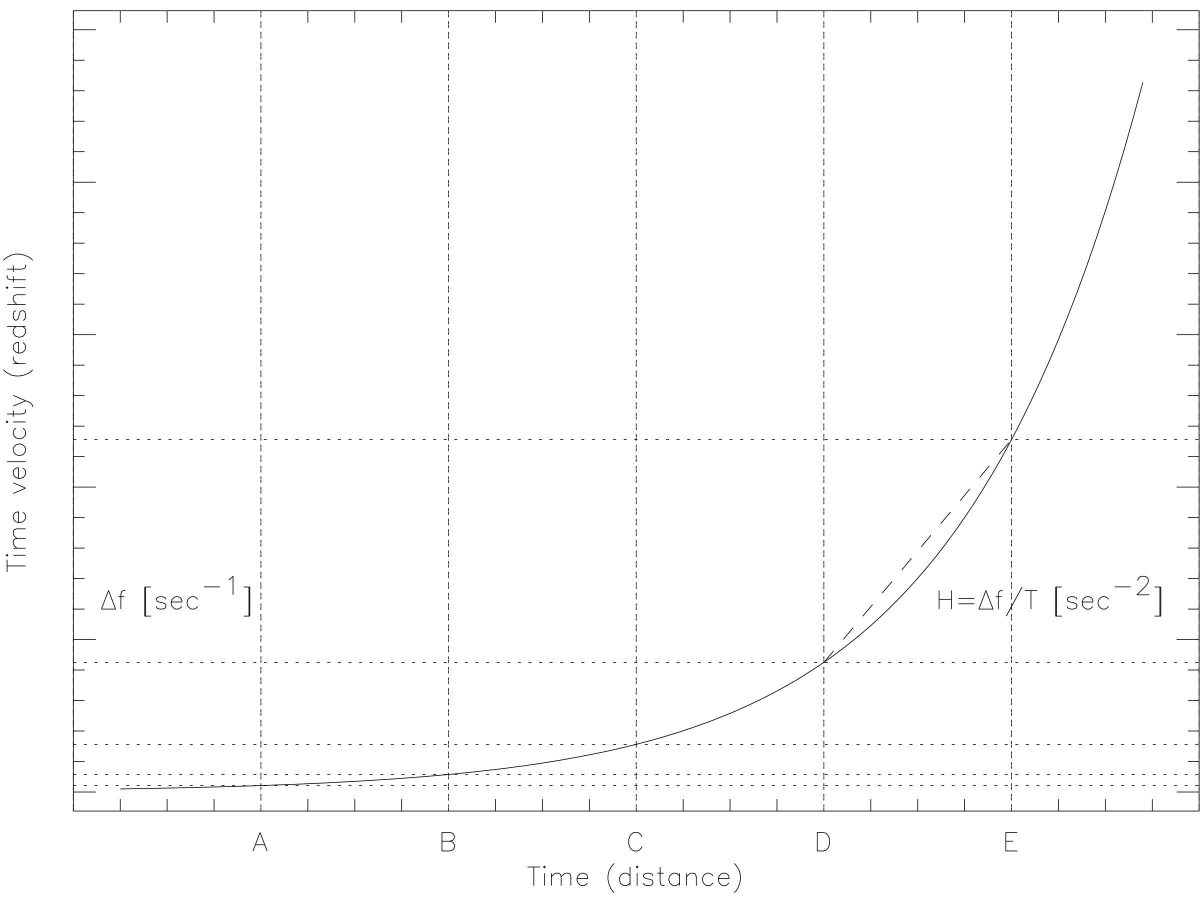
The theory described above suggests alternative descriptions of various observations, which may be interpreted as follows:
1. Decreasing entropy on the surfaces of massive (compact) stars (neutron stars and white dwarfs) results in a deceleration of time on them. This in turn results in an observed redshift of radiation from these objects.
2.No theory of particle acceleration can explain the observed cosmic rays with energies greater than $10^{18} ergs$. The accelerated time resulting from an increase in entropy let us describe acceleration of cosmic rays up to $10^{20} ergs$ with standard (typical) mechanisms. For example, particles accelerated by supernova shock wave up to $10^{18} ergs$ will be observed with energies greater than $10^{20} ergs$ (because a supernova explosion is a very strong source of entropy it will result in a large acceleration of time).

Conclusion

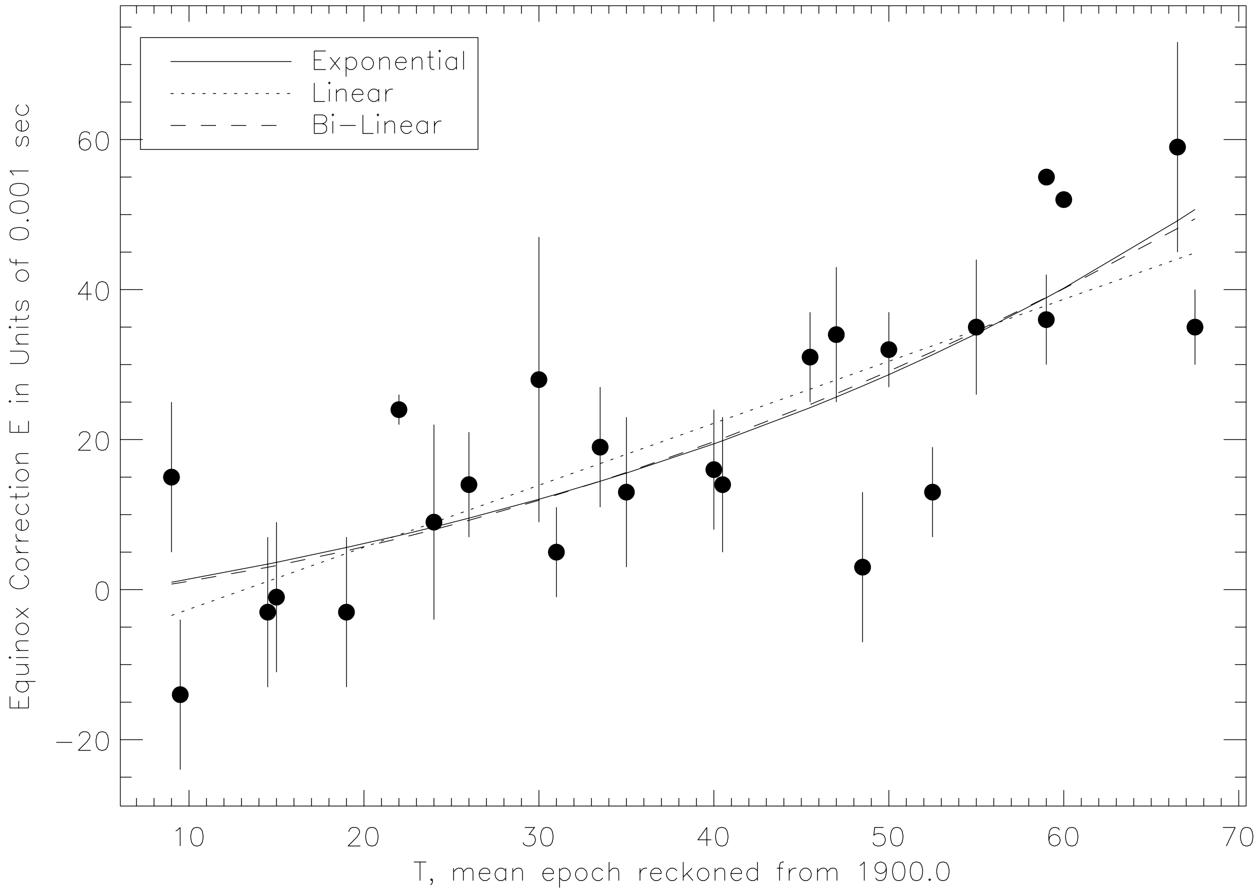
The ideas presented here are speculative and I am interested to talk to people who may be able to test them.

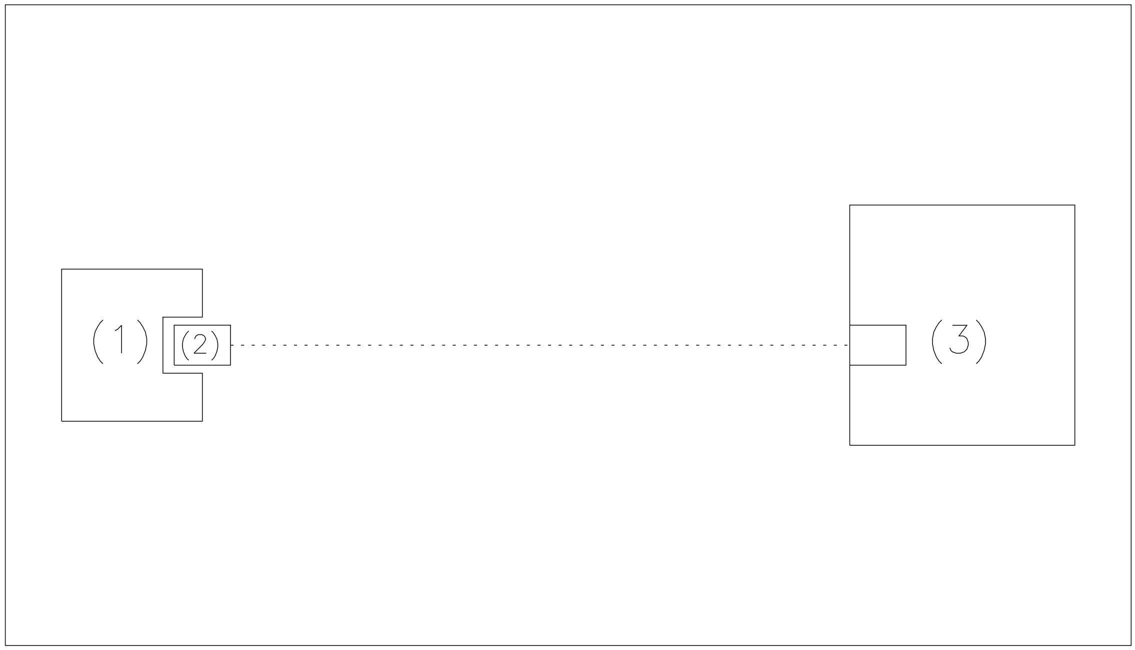
References

1. W.Fricke, Astron.Astrophys. 107 L13-L16(1982)



Time velocity (redshift)
Δf [sec^{-1}]
H=Δf/T [sec^{-2}]
A
B
C
D
E
Time (distance)


Exponential
Linear
Bi-Linear
Equinox Correction E in Units of 0.001 sec
60
40
20
0
−20
10
20
30
40
50
60
70
T, mean epoch reckoned from 1900.0


(1)
(2)
(3)